Claims

1) A molten metal containment device between the crystallising rollers (38, 39) of a continuous casting machine for metallic products, where said crystallising rollers (38, 39) are able to rotate around two axes (A1, A2) substantially horizontal, and are placed in positions such as to define between them a zone of minimal distance (50) between the surfaces of said crystallising rollers (38, 39) and so to allow, in the space above said zone of minimal distance (50), the accumulation of a molten metal bath poured from a tundish or other means of distribution, each of said crystallising rollers (38, 39) comprising one or more shoulder surfaces (40, 41) lying in a plane normal to the axis of rotation (A1, A2) of said crystallising roller (38, 39), said containment device comprising, on each side of said crystallising rollers (38, 39)

- a lateral containment plate (47) able to fit tightly against at least part of each of said shoulder surfaces (40, 41) of said crystallising rollers (38, 39) so as to contain said molten metal bath;
- means of providing pressure (37) able to move said lateral containment plate (47) so as to bring it close to and hold it tightly against said shoulder surfaces (40, 41) of both said crystallising rollers (38, 39) and/or remove said lateral containment plate (47) from both said shoulder surfaces (40, 41) of said crystallising rollers;

where said lateral containment plate (47) is fixed to said means of providing pressure (37) through an articulated joint,

said containment device being characterised by the fact that

said articulated joint comprises a flexible connecting element (1) able to sustain said lateral containment plate (47) allowing the horizontal pivoting at least around an axis of pivoting (X) horizontal and substantially not parallel to said axes of rotation (A1, A2) of said crystallising rollers (38, 39).

2) The containment device according to claim 1, characterised by the fact that said flexible connecting element (1) comprises a flexible tubular sleeve.

3) The containment device according to claim 2, characterised by the fact that said flexible tubular sleeve (1) comprising one or more corrugated walls like a bellows able to allow said horizontal pivoting of said containment plate (37) at least around said axes of pivoting (X).

4) The device according to claims 2 and/or 3, characterised by the fact that said flexible tubular sleeve (1) is connected to said means of providing pressure (37) and to said lateral containment plate (47) in such a way, and has such flexibility, to sustain the latter functioning substantially as a cantilever shelf.

5) The device according to one or more of the claims from 2 to 4, characterised by the fact that said flexible tubular sleeve (1) has the shape such as to be part of a route for a cooling fluid able to cool at least said one or more walls of said flexible tubular sleeve (1).

6)The device according to claim 5, characterised by the fact of comprising an internal body (5) of shape such, and placed inside said flexible tubular sleeve (1) in a way such, to define one or more internal spaces between said internal body (5) and the internal wall(s) of said flexible tubular sleeve (1), where said one or more internal spaces are part of said route for a cooling fluid.

7) The device according to claim 6, characterised by the fact that said internal body comprises lateral surfaces of shape and dimensions such that each point of said lateral surface is found substantially at a distance, from the closet point of the internal walls of said flexible tubular sleeve (1), when said flexible tubular sleeve (1) is in undeformed conditions, never less than a predetermined minimal distance (H) and that said flexible tubular sleeve (1) comprising one or more nervatures (13a, 13b, 13c, 13d) which surround the transversal sections of said flexible tubular sleeve (1), and one or more grooves (11a, 11b, 11c, 11d) interposed between two of said circular nervatures (13a, 13b, 13c, 13d).

8)The device according to claim 7, characterised by the fact that said nervatures (13a, 13b, 13c, 13d) are at least two, have circular shape and are closet on themselves, said one or more grooves (11a, 11b, 11c, 11d) have circular shape closet on themselves and said external surfaces of said internal body (5) comprises one or more notched areas (10a, 10b, 10c, 10d), each of which has a surface of shape and dimensions such that each point of it is found substantially at a distance, from the closet point of the internal walls of said undeformed flexible tubular sleeve (1), greater than said predetermined minimal distance (H), so as to assist the flow of said cooling fluid from a cavity below a first of said circular nervatures (13a, 13b, 13c) to the cavity below a second of said circular nervatures (13b, 13c, 13d) closer to the outlet of the cooling circuit.

9)The device according to claim 8, characterised by the fact that said external surface of said internal body (5) comprising a plurality of notched areas (10a, 10b, 10c, 10d) placed to form two groups, where each of said two groups is found to the side of said external surfaces opposite with respect to the side on which is found the other of said two groups.

10)The device according to claims 8 and/or 9, characterised by the fact that said internal body said one or more notched areas (10a, 10b, 10c, 10d) have

substantially oblong shape and are located substantially parallel to the closest of said one or more grooves (11a, 11b, 11c, 11d) of said flexible tubular sleeve (1).

11)The device according to one or more claims from 5 to 10, characterised by the fact that each of said internal spaces between said tubular sleeve (1) and said internal body (5) is closed close to one end of said sleeve by a wall (9), and in said walls are etched one or more apertures (14), located around said flexible tubular sleeve (1) and able to allow the flow of said refrigerant liquid from said flexible tubular sleeve (1).

12)The device according to one or more of the claims from 6 to 11, characterised by the fact that said internal body (5) has shape and dimensions such, and said flexible tubular sleeve (1) is connected to said means of providing pressure (37) and to said lateral containment plate (47) in a way such, and has shape, dimensions and such flexibility, that said internal body (5) and said flexible tubular sleeve (1) during normal functioning do not come into contact with each other even under the effect of the weight of said lateral containment plate (47) and the support (2) onto which said plate (47) is optionally fixed, even due to the effect of said horizontal pivoting due to the geometric imperfections of said crystallising rollers (38, 39).

13)The device according to one or more of the preceding claims, characterised by the fact of comprising means for the measurement of the pressure of said cooling fluid inside said internal space, and means for the control of said pressure of said cooling fluid, able to control the pushing of said lateral containment plate (47) against said crystallising rollers (38, 39) on the basis of said pressure of cooling fluid inside said internal space.

14)The device according to one or more of the preceding claims, characterised by the fact of comprising one or more mechanical butts (160) able to limit said horizontal pivoting of said containment plate (47).

15) A molten metal containment device between the crystallising rollers (38, 39) of a continuous casting machine for metallic products, where said crystallising rollers (38, 39) are able to rotate around two substantially horizontal axes (A1, A2), and are located in positions such as to define between them a zone of minimal distance (50) between the surfaces of said crystallising rollers (38, 39) and to allow, in the space above said zone of minimal distance (50), the accumulation of a molten metal bath poured from a tundish or from other means of distribution, each of said crystallising rollers (38, 39) comprising one or more shoulder surfaces (40, 41) lying in a plane normal to the axis of rotation of said crystallising

roller (38, 39), said containment device comprising, on each side of said crystallising rollers (38, 39)

- a lateral containment plate (47) able to fit tightly against at least part of said shoulder surfaces (40, 41) of both of said crystallising rollers (38, 39) so as to contain said molten metal bath;
- means of providing pressure (37) able to move said lateral containment plate (47) so as to move it close to and press it against said shoulder surfaces (40, 41) of both said crystallising rollers (38, 39) and/or remove said lateral containment plate (47) of said shoulder surfaces (40, 41) of both of said crystallising rollers;

said lateral containment plate (47) is fixed to said means of providing pressure (37) through a plurality of supports (20) able to sustain the weight at least of said lateral containment plate (47), where each of said supports (20) is able to apply onto said lateral containment plate (47) a force with at least a horizontal component, said plurality of supports being placed in a way such that at least one of said supports (20) is positioned at a greater height than the other of said supports (20).

16) The device according to claim 15, characterised by the fact that said supports (20) are at least three in number placed to form a triangle.

17) The device according to the claims 15 and/or 16, characterised by the fact that said triangle has height equal to at least 20-30% of the height of said containment plate (47).

18) The device according to one or more of the claims from 15 to 17, characterised by the fact that said triangle has width, according to a horizontal coordinate, equal to at least 20% of the width of said containment plate (47).

19) The device according to one or more of the claims from 15 to 18, characterised by the fact that each of said supports (20) comprises a cursor (22) fixed onto a first support (2) on which in turn is fixed said lateral containment plate (47), and a tubular sleeve (21), fixed onto a second support (3) fixed in turn onto said means of providing pressure (37), said cursor (22) being fixed to said sleeve (21) in a way allowing it to move with respect to it.

20) The device according to one or more of the claims from 15 to 19, characterised by the fact that each of said supports (20) comprises a spring (23) able to apply an at least horizontal force on said cursor (22).